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(54) Title: MONITORING MOLECULAR INTERACTIONS USING PHOTON ARRIVAL-TIME INTERVAL DISTRIBUTION ANALYSIS

(57) **Abstract:** A method for analyzing/monitoring the properties of species that are labeled with fluorophores. A detector is used to detect photons emitted from species that are labeled with one or more fluorophores and located in a confocal detection volume. The arrival time of each of the photons is determined. The interval of time between various photon pairs is then determined to provide photon pair intervals. The number of photons that have arrival times within the photon pair intervals is also determined. The photon pair intervals are then used in combination with the corresponding counts of intervening photons to analyze properties and interactions of the molecules including brightness, concentration, coincidence and transit time. The method can be used for analyzing single photon streams and multiple photon streams.